CLAIMS

What is claimed is:

1. A method of transmitting information a communications network, comprising the steps of:

receiving a request to transmit the information, said request including a service constraint;

generating a requested transport constraint based on the service constraint;

parsing contents of a bit-field-encoded record corresponding to a link in the communications network to determine whether the link is capable of supporting the requested transport constraint, wherein the bit-field-encoded record comprises a field having a length of at least two bits, the field being configured to specify a supported transport constraint; and

if the requested transport constraint is compatible with the supported transport constraint, transmitting the information over the link.

2. The method of claim 1, wherein the link is configured to carry an optical signal.

3. The method of claim 1, wherein the link is configured to carry an electrical signal.

4. The method of claim 1, wherein the link is configured to carry a wireless signal.

5. The method of claim 2, wherein the link is coupled to a phototonic cross-connect device.

6. The method of claim 5, wherein the link is DWDM-controlled.

7. The method of claim 1, further comprising the step of identifying a set of links in the communications network capable of supporting the requested transport constraint to form a new network topology.

8. The method of claim 7, wherein the new network topology is stored in a network topology database.

9. The method of claim 7, further comprising the step of selecting a subset of links from the new network topology to form a route for transmitting the information.

10. The method of claim 9, wherein the selecting step is carried out using a link state shortest path first (SPF) routing algorithm.

11. The method of claim 10, wherein the link state SPF routing algorithm is the Dijkstra SPF algorithm.

12. The method of claim 10, wherein the link state SPF routing algorithm is the Bellman-Ford Vector algorithm.

13. The method of claim 9, further comprising the step of storing the route in a routing table.

14. The method of claim 1, wherein the parsing step is carried out using a specified bit-field definition.

15. The method of claim 14, wherein the specified bit-field definition defines a class of information the link is configured to carry.

16. The method of claim 1, further comprising the step of storing the bit-field-encoded record in a link state database.

17. The method of claim 1, further comprising the step of storing the bit-field-encoded record in a plurality of link state databases, each link state database in the plurality of link state databases residing at a single node in the communications network.

18. The method of claim 1, wherein the bit-field-encoded record comprises at least one of:

a line-coding field;

a dispersion compensation technique field;

a frequency band field;

a wavelength identifier field;

a wavelength band identifier field; and

a fiber type field.

19. The method of claim 1, wherein the bit-field-encoded record comprises a bit-field encoded portion and a bit-mask-encoded portion.

20. The method of claim 1, wherein the length of the bit-field-encoded record is thirty-two bits.

21. The method of claim 1, wherein the length of the bit-field-encoded record is sixty-four bits.

22. The method of claim 1, wherein the length of the bit-field-encoded record is 128 bits.

23. The method of claim 1, wherein the service constraint comprises a bandwidth requirement.

24. The method of claim 1, wherein the service constraint comprises a request to avoid using a specified node.

25. The method of claim 1, wherein the service constraint comprises a request to use a specified node.

26. The method of claim 1, wherein the service constraint comprises a request to avoid using a specified link.

27. The method of claim 1, wherein the service constraint comprises a request to use a specified link.

28. The method of claim 1, wherein the information comprises voice data.

29. The method of claim 1, wherein the information comprises video data.

30. A method for identifying a link for transmitting information in a communications network, comprising:

receiving a request to transmit the information, said request including a service constraint;

generating a requested transport constraint based on the service constraint;

parsing contents of a bit-field-encoded record associated with the link to determine whether the link is capable of supporting the requested transport constraint, wherein the bit-field-encoded record comprises a field having a length of at least two bits, the field being configured to specify a supported transport constraint; and

comparing the requested transport constraint with the supported transport constraint.

31. The method of claim 30, further comprising the step of transmitting the information over the link if the requested transport constraint is compatible with the supported transport constraint.

32. The method of claim 30, wherein the link is configured to carry an optical signal.

33. The method of claim 30, wherein the link is configured to carry an electrical signal.

34. The method of claim 30, wherein the link is configured to carry a wireless signal.

35. The method of claim 32, wherein the link is coupled to a phototonic cross-connect device.

36. The method of claim 35, wherein the link is DWDM-controlled.

37. The method of claim 30, further comprising the step of identifying a set of links in the communications network capable of supporting the requested transport constraint to form a new network topology.

38. The method of claim 37, wherein the new network topology is stored in a network topology database.

39. The method of claim 37, further comprising the step of selecting a subset of links from the new network topology to form a route for transmitting the information.

40. The method of claim 39, wherein the selecting step is carried out using a link state routing protocol.shortest path first (SPF) routing algorithm.

41. The method of claim 40, wherein the link state SPF routing algorithm is the Dijkstra SPF algorithm .

42. The method of claim 40, wherein the link state SPF routing algorithm is the Bellman-Ford Vector algorithm.

43. The method of claim 39, further comprising the step of storing the route in a routing table.

44. The method of claim 30, wherein the parsing step is carried out using a bit-field definition.

45. The method of claim 44, wherein the bit-field definition defines a class of information the link is configured to carry.

46. The method of claim 30, further comprising the step of storing the bit-field-encoded record in a link state database.

47. The method of claim 30, further comprising the step of storing the bit-field-encoded record in a plurality of link state databases, each link state database in the plurality of link state databases residing at a single node in the communications network.

48. The method of claim 30, wherein the bit-field-encoded record comprises at least one of:

a line-coding field;

a dispersion compensation technique field;

a frequency band field;

a wavelength identifier field;

a wavelength band identifier field; and

a fiber type field.

49. The method of claim 30, wherein the bit-field-encoded record comprises a bit-field encoded portion and a bit-mask-encoded portion.

50. The method of claim 30, wherein the bit-field-encoded record has a length of thirty-two bits.

51. The method of claim 30, wherein the bit-field-encoded record has a length of sixty-four bits.

52. The method of claim 30, wherein the bit-field-encoded record has a length of 128 bits.

53. The method of claim 30, wherein the service constraint comprises a bandwidth requirement.

54. The method of claim 30, wherein the service constraint comprises a request to avoid using a specified node.

55. The method of claim 30, wherein the service constraint comprises a request to use a specified node.

56. The method of claim 30, wherein the service constraint comprises a request to avoid using a specified link.

57. The method of claim 30, wherein the service constraint comprises a request to use a specified link.

58. The method of claim 30, wherein the information comprises voice data.

59. The method of claim 30, wherein the information comprises video data.

60. A method of transmitting information over a communications network, comprising the steps of:

receiving a request to transmit the information, said request including a service constraint;

generating a requested transport constraint based on the service constraint;

identifying a set of network links in the communications network capable of supporting the requested transport constraint by parsing contents of a plurality of bit-field-encoded records, each of the plurality of bit-field-encoded records including a field having a length of at least two bits, said field being configured to specify a supported transport constraint;

comparing the requested transport constraint to the supported transport constraint; and

transmitting the information over a subset of the set of network links.

61. The method of claim 60, wherein at least one of the network links in the set of network links is configured to carry an optical signal.

62. The method of claim 60, wherein at least one of the network links in the set of network links is configured to carry an electronic signal.

63. The method of claim 60, wherein at least one of the network links in the set of network links is configured to carry a wireless signal.

64. The method of claim 60, further comprising the step of storing the bit-field-encoded record in a link state database.

65. The method of claim 61, wherein the set of network links is coupled to a plurality of phototonic cross-connect devices.

66. The method of claim 65, wherein at least one network link in the set of network links is DWDM-controlled.

67. The method of claim 60, further comprising the step of using the set of network links to generate a new network topology.

68. The method of claim 67, wherein the new network topology is stored in a network topology database.

69. The method of claim 67, further comprising the step of selecting the subset from the new topology to form a route for transmitting the information.

70. The method of claim 69, wherein the selecting step is carried out using a link state routing protocol.shortest path first (SPF) routing algorithm.

71. The method of claim 70, wherein the link state SPF routing algorithm is the Dijkstra SPF algorithm.

72. The method of claim 70, wherein the link state SPF routing algorithm is the Bellman-Ford Vector algorithm.

73. The method of claim 69, further comprising the step of storing the route in a routing table.

74. The method of claim 60, wherein the parsing step is carried out using a specified bit-field definition.

75. The method of claim 74, wherein the specified bit-field definition defines a class of information the set of network links is configured to carry.

76. The method of claim 60, further comprising the step of storing each bit-field-encoded record in the plurality of bit-field-encoded records in a link state database.

77. The method of claim 60, further comprising the step of storing each bit-field-encoded record in the plurality of bit-field-encoded records in a plurality of link state databases, each link state database in the plurality of link state databases residing at a single node in the communications network.

78. The method of claim 60, wherein each bit-field-encoded record in the plurality of bit-field-encoded records comprises at least one of:

a line-coding field;

a dispersion compensation technique field;

a frequency band field;

a wavelength identifier field;

a wavelength band identifier field; and

a fiber type field.

79. The method of claim 60, wherein each bit-field-encoded record in the plurality of bit-field-encoded records comprises a bit-field encoded portion and a bit-mask-encoded portion.

80. The method of claim 60, wherein each bit-field-encoded record in the plurality of bit-field encoded records has a length of thirty-two bits.

81. The method of claim 60, wherein each bit-field-encoded record in the plurality of bit-field encoded records has a length of sixty-four bits.

82. The method of claim 60, wherein each bit-field-encoded record in the plurality of bit-field encoded records has a length of 128 bits.

83. The method of claim 60, wherein the service constraint comprises a bandwidth requirement.

84. The method of claim 60, wherein the service constraint comprises a request to avoid using a specified node.

85. The method of claim 60, wherein the service constraint comprises a request to use a specified node.

86. The method of claim 60, wherein the service constraint comprises a request to avoid using a specified link.

87. The method of claim 60, wherein the service constraint comprises a request to use a specified link.

88. The method of claim 60, wherein the information comprises voice data.

89. The method of claim 60, wherein the information comprises video data.

90. A method of transmitting information over a communications network, comprising the steps of:

receiving a request to transmit the information, said request including a requested transport constraint;

parsing contents of a bit-field-encoded record corresponding to a link in the communications network to determine whether the link is capable of supporting the requested transport constraint, wherein the bit-field-encoded record comprises a field having a length of at least two bits, said field being configured to specify a supported transport constraint;

comparing the requested transport constraint to the supported transport constraint; and

transmitting the information over the link if the requested transport constraint is compatible with the supported transport constraint.

91. The method of claim 90, wherein the link is configured to carry an optical signal.

92. The method of claim 90, wherein the link is configured to carry an electronic signal.

93. The method of claim 90, wherein the link is configured to carry a wireless signal.

94. The method of claim 90, further comprising the step of storing the bit-field-encoded record in a link state database.

95. The method of claim 91, wherein the link is coupled to a phototonic cross-connect device.

96. The method of claim 95, wherein the link is DWDM-controlled.

97. The method of claim 90, further comprising the step of identifying a set of links in the communications network capable of supporting the transport constraint to form a new network topology.

98. The method of claim 97, wherein the new network topology is stored in a network topology database.

99. The method of claim 97, further comprising the step of selecting a subset of links from the new network topology to form a route for transmitting the information.

100. The method of claim 99, wherein the selecting step is carried out using a link state routing protocol.shortest path first (SPF) routing algorithm.

101. The method of claim 100, wherein the link state SPF routing algorithm is the Dijkstra SPF algorithm.

102. The method of claim 100, wherein the link state SPF routing algorithm is the Bellman-Ford Vector algorithm.

103. The method of claim 99, further comprising the step of storing the route in a routing table.

104. The method of claim 90, wherein each bit-field-encoded record comprises at least one of:
a line-coding field;
a dispersion compensation technique field;
a frequency band field;
a wavelength identifier field;
a wavelength band identifier field; and
a fiber type field.

105. A system for transmitting information over a communications network, comprising:

means for receiving a request to transmit the information, said request including a service constraint;

means for converting the service constraint into a requested transport constraint;

means for parsing contents of a bit-field-encoded record corresponding to a link in the communications network to determine whether the link is capable of supporting

the requested transport constraint, wherein the bit-field-encoded record comprises a field having a length of at least two bits, said field being configured to specify a supported transport constraint;

means for comparing the requested transport constraint with the supported transport constraint; and

means, responsive to said comparing means, for transmitting the information over the link if the requested transport constraint is compatible with the supported transport constraint.

106. The system of claim 105, wherein the link is configured to carry an optical signal.

107. The system of claim 105, wherein the link is configured to carry an electronic signal.

108. The system of claim 105, wherein the link is configured to carry a wireless signal.

109. The system of claim 105, further comprising means for storing the bit-field-encoded record in a memory area accessible to said parsing means.

110. The system of claim 109, wherein

the link is coupled to a photototonic cross-connect device; and

the memory area is associated with the photototonic cross-connect device.

111. The system of claim 110, wherein the link is DWDM-controlled.

112. The system of claim 109, wherein the memory area resides on a central node in the communications network.

113. The system of claim 105, further comprising means for identifying a set of links in the communications network to form a new network topology.

114. The system of claim 113, further comprising means for storing the new network topology in a network topology database.

115. The system of claim 113, further comprising means for selecting a subset of links from the new network topology to form a route for transmitting the information.

116. The system of claim 115, wherein the means for selecting the subset is configured to operate according to a link state shortest path first (SPF) routing algorithm.

117. The system of claim 116, wherein the link state SPF routing algorithm is the Dijkstra SPF algorithm.

118. The system of claim 116, wherein the link state SPF routing algorithm is the Bellman-Ford Vector algorithm.

119. The system of claim 115, further comprising means for storing the route in a routing table.

120. The system of claim 105, wherein the contents of the bit-field-encoded record are parsed according to a bit-field definition.

121. The system of claim 120, wherein the bit-field definition defines a class of information the link is configured to carry.

122. The system of claim 105, further comprising means for storing the bit-field-encoded record in a plurality of link state databases, each link state database in the plurality of link state databases residing at a single node in the communications network.

123. The system of claim 105, further comprising means for storing the bit-field-encoded record in a centralized link state database in the communications network.

124. The system of claim 105, wherein the bit-field-encoded record comprises at least one of:

a line-coding field;

a dispersion compensation technique field;

a frequency band field;

a wavelength identifier field;

a wavelength band identifier field; and

a fiber type field.

125. The system of claim 105, wherein the bit-field-encoded record comprises a bit-field encoded portion and a bit-mask-encoded portion.

126. The system of claim 105, wherein the bit-field-encoded record has a length of thirty-two bits.

127. The system of claim 105, wherein the bit-field-encoded record has a length of sixty-four bits.

128. The system of claim 105, wherein the bit-field-encoded record has a length of 128 bits.

129. The system of claim 105, wherein the service constraint comprises a bandwidth requirement.

130. The system of claim 105, wherein the service constraint comprises a request to avoid using a specified node.

131. The system of claim 105, wherein the service constraint comprises a request to use a specified node.

132. The system of claim 105, wherein the service constraint comprises a request to avoid using a specified link.

133. The system of claim 105, wherein the service constraint comprises a request to use a specified link.

134. The system of claim 105, wherein the information comprises voice data.

135. The system of claim 105, wherein the information comprises video data.

136. A system for determining a route to transmit information over a communications network, comprising:

a constraint processor configured to receive a service request to transmit the information,

said request including a service constraint, and to convert the service constraint into a requested transport constraint associated with the service request;

a bit-field-encoded record comprising a field having a length of at least two bits, said field being configured to specify a supported transport constraint for a link; and

a routing processor configured to parse contents of the bit-field-encoded record to determine whether the link is capable of supporting the requested transport constraint.

137. The system of claim 136, wherein the link is configured to carry an optical signal.

138. The system of claim 136, wherein the link is configured to carry an electronic signal.

139. The system of claim 136, wherein the link is configured to carry a wireless signal.

140. The system of claim 137, further comprising a link state database; and wherein the bit-field-encoded record is stored in the link state database.

141. The system of claim 140, wherein:

the link is coupled to a phototonic cross-connect device; and

the link state database resides in a memory area associated with the phototonic cross-connect device.

142. The system of claim 141, wherein the link is DWDM-controlled.

143. The system of claim 136, the routing processor is further configured to select a set of links in the communications network to form a new network topology.

144. The system of claim 143, wherein the routing processor is further configured to store the new network topology in a network topology database.

145. The system of claim 143, wherein the routing processor is further configured to select a subset of links from the new network topology to form a route for transmitting the information.

146. The system of claim 145, wherein subset is selected according to a link state SPF (Shortest path first) routing algorithm.

147. The system of claim 146, wherein the link state SPF routing algorithm is the Dijkstra SPF algorithm.

148. The system of claim 146, wherein the link state SPF routing algorithm is the Bellman-Ford Vector algorithm.

149. The system of claim 145, further comprising a routing table; and wherein the route is stored in the routing table.

150. The system of claim 136, wherein the routing processor is further configured to parse contents of the bit-field-encoded record according to a specified bit-field definition.

151. The system of claim 150, wherein the specified bit-field definition defines a class of information the link is configured to carry.

152. The system of claim 136, further comprising a link state database; and wherein the bit-field-encoded record is stored in the link state database.

153. The system of claim 136, wherein the bit-field-encoded record is stored in a plurality of link state databases, each link state database in the plurality of link state databases residing at a single node in the network.

154. The system of claim 136, wherein the bit-field-encoded record comprises at least one of:

a line-coding field;

a dispersion compensation technique field;

a frequency band field;

a wavelength identifier field;

a wavelength band identifier field; and

a fiber type field.

155. The system of claim 136, wherein the bit-field-encoded record comprises a bit-field encoded portion and a bit-mask-encoded portion.

156. The system of claim 136, wherein the bit-field-encoded record has a length of thirty-two bits.

157. The system of claim 136, wherein the bit-field-encoded record has a length of sixty-four bits.

158. The system of claim 136, wherein the bit-field-encoded record has a length of 128 bits.

159. The system of claim 136, wherein the service constraint comprises a bandwidth requirement.

160. The system of claim 159, wherein the service constraint comprises a request to avoid using a specified node.

161. The system of claim 159, wherein the service constraint comprises a request to use a specified node.

162. The system of claim 159, wherein the service constraint comprises a request to avoid using a specified link.

163. The system of claim 159, wherein the service constraint comprises a request to use a specified link.

164. The system of claim 136, wherein the information comprises voice data.

165. The system of claim 136, wherein the information comprises video data.

166. A system for transmitting information over an communications network, comprising:

a constraint processor configured to receive a request to transmit the information, said request including a service constraint, and to convert the service constraint into a transport constraint;

a plurality of bit-field-encoded records, wherein each of the plurality of bit-field-encoded records includes a field having a length of at least two bits, the field being configured to specify a supported transport constraint; and

a routing processor configured to parse contents of each bit-field-encoded record in the plurality of bit-field-encoded records to identify a set of links in the optical network capable of supporting the transport constraint.

167. The system of claim 166, further comprising a transmitter for transmitting the information over a subset of the identified set of network links.

168. The system of claim 166, wherein at least one link in the set of links is configured to carry an optical signal.

169. The system of claim 166, wherein at least one link in the set of links is configured to carry an electronic signal.

170. The system of claim 166, wherein at least one link in the set of links is configured to carry a wireless signal.

171. The system of claim 166, further comprising a link state database; and
the plurality of bit-field-encoded records is stored in the link state database.

172. The system of claim 171, wherein:

the set of links is coupled to phototonic cross-connect devices; and

the link state database resides in a memory area associated with the phototonic cross-connect device.

173. The system of claim 172, wherein:

at least one of the links in the set of links is DWDM-controlled.

174. The system of claim 171, wherein the link state database resides on a central node in the communications network.

175. The system of claim 166, wherein the routing processor is further configured to select a subset of the set of network links to form a new network topology.

176. The system of claim 175, wherein the routing processor is further configured to store the new network topology in a network topology database.

177. The system of claim 175, wherein the routing processor is further configured to select a subset of links from the new network topology to form a route for transmitting the information.

178. The system of claim 177, wherein the subset is selected according to a specified link state SPF (Shortest path first) routing algorithm.

179. The system of claim 178, wherein the specified link state SPF routing algorithm is the Dijkstra SPF algorithm.

180. The system of claim 178, wherein the specified link state SPF routing algorithm is the Bellman-Ford Vector algorithm.

181. The system of claim 177, further comprising a routing table; and wherein the route is stored in the routing table.

182. The system of claim 166, wherein the contents of the plurality of bit-field-encoded records are parsed according to a specified bit-field definition.

183. The system of claim 182, wherein the specified bit-field definition defines a class of information the link is configured to carry.

184. The system of claim 166, wherein the plurality of bit-field-encoded records is stored in a plurality of link state databases, each link state database in the plurality of link state databases residing at a single node in the communications network.

185. The system of claim 166, wherein each bit-field-encoded record in the plurality of bit-field-encoded records comprises at least one of:

a line-coding field;

a dispersion compensation technique field;

a frequency band field;

a wavelength identifier field;

a wavelength band identifier field; and

a fiber type field.

186. The system of claim 166, wherein each bit-field-encoded record in the plurality of the bit-field-encoded records comprises a bit-field encoded portion and a bit-mask-encoded portion.

187. The system of claim 166, wherein each bit-field-encoded record in the plurality of bit-field-encoded records has a length of thirty-two bits.

188. The system of claim 166, wherein each bit-field-encoded record in the plurality of bit-field-encoded records has a length of sixty-four bits.

189. The system of claim 166, wherein each bit-field-encoded record in the plurality of bit-field-encoded records has a length of 128 bits.

190. The system of claim 166, wherein the service constraint comprises a bandwidth requirement.

191. The system of claim 166, wherein the service constraint comprises a request to avoid using a specified node.

192. The system of claim 166, wherein the service constraint comprises a request to use a specified node.

193. The system of claim 166, wherein the service constraint comprises a request to avoid using a specified link.

194. The system of claim 166, wherein the service constraint comprises a request to use a specified link.

195. The system of claim 166, wherein the information comprises voice data.

196. The system of claim 166, wherein the information comprises video data.